

CLAIMS

1. Apparatus for the ultrasonic treatment of tissue, including:

5 a housing having a space therewithin and an opening adapted for placement against the tissue, the housing being adapted for introducing liquid therein such that when so placed, the space is filled with liquid; and

an ultrasonic power source that introduces ultrasonic vibrations toward the damaged tissue, said vibrations having a frequency and power level sufficient to produce cavitation of the liquid at or near the surface of the tissue.

10 2. Apparatus according to claim 1, wherein the opening comprises a sealing element that provides a seal at the tissue.

3. Apparatus according to claim 2, wherein the seal includes a flexible element.

15 4. Apparatus according to claim 2, wherein the seal includes an outwardly protruding portion that is placed to contact the tissue surface.

20 5. Apparatus according to claim 3, wherein the seal includes an outwardly protruding portion that is placed to contact the tissue surface.

6. Apparatus according to claim 2, wherein the seal includes an inwardly protruding portion that is placed to contact the tissue surface.

25 7. Apparatus according to claim 3, wherein the seal includes an inwardly protruding portion that is placed to contact the tissue surface.

8. Apparatus according to any of the preceding claims, wherein the ultrasonic power source includes a piezoelectric transducer.

30 9. Apparatus according to any of claims 1-7 wherein the ultrasonic power source generates acoustic energy with a frequency of vibration of not more than 80 kHz.

10. Apparatus according to any of claims 1-7 wherein the ultrasonic power source generates acoustic energy with a frequency of vibration of not less than 30 kHz

11. Apparatus according to claim 9 wherein the ultrasonic power source generates acoustic energy with a frequency of vibration of not less than 30 kHz.

12. Apparatus according to any claims 1-7 wherein the housing comprises a liquid inlet adapted for introduction of liquid into the space.

13. Apparatus according to claim 12 wherein the housing comprises a liquid outlet adapted for the removal of liquid from the space.

14. Apparatus according to claim 13 wherein the outlet is disposed at the apex of the space, such that any air in the space is removed via the outlet, when liquid is introduced to fill the space.

15. Apparatus according to any of claim 13 wherein the inlet and the outlet are situated on opposite sides of the opening such that liquid passing through the space from the inlet to the outlet irrigates the tissue.

16. Apparatus according to any of claim 14 wherein the inlet and the outlet are situated on opposite sides of the opening such that liquid passing through the space from the inlet to the outlet irrigates the tissue.

17. Apparatus according to any of claims 1-7 wherein the ultrasonic vibrations are introduced into the space through an acoustic port in the housing.

18. Apparatus according to claim 17, comprising wherein the acoustic port has acoustic properties similar to that of said liquid.

19. Apparatus according to claim 17 wherein the acoustic port is formed in the housing.

20. Apparatus according to claim 19 wherein at least the acoustic port is formed of an elastomer material.

21. Apparatus according to claim 17 wherein the distance between the portal and the opening is less than one-half wavelength of the ultrasonic vibrations in the liquid.

22. Apparatus according to any of claims 1-7 wherein the housing is formed of an elastomer material.

23. Apparatus according to any of claims 1-7, wherein at least a portion of the housing means is transparent.

24. Apparatus according to any of claims 1-7 wherein the housing is formed with a protrusion into the space over a central portion of the opening.

25. Apparatus according to claim 24 wherein ultrasonic energy enters said space at said protrusion.

26. Apparatus according to claims 1-7, wherein the opening is in the form of a right angle cut in the housing, such that the housing is upright when the opening is placed on a horizontal portion of skin.

27. Apparatus according to any of claims 1-7 wherein the opening is in the form of an acute angle cut in the housing, such that the housing is upright when the opening is placed on a skin surface that is at an angle to the horizontal.

28. A method for treating tissue, including:
providing a liquid in contact with a surface of the tissue; and
causing ultrasonic vibrations in the liquid to an extent that cavitation is caused at least at or near the surface of the tissue.

29. A method according to claim 28, wherein the frequency of the ultrasonic vibrations is not more than 80 kHz.

30. A method according to claim 28, including producing a fluid current moving through the liquid, the current allowing for the removal of debris from the tissue surface.

5 31. A method according to claim 29, including producing a fluid current moving through the liquid, the current allowing for the removal of debris from the tissue surface.

32. A method according to any of claims 28-31 wherein the frequency of vibration is not less than 30 kHz.

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33. A method of applying ultrasound to a surface of a patient, comprising:

providing a housing having an opening at one portion thereof and having a source of acoustic energy at a portion of an inner surface thereof;

placing the opening at the patient surface, to form a substantially closed volume in the

15 housing;

filling the volume with liquid, so that all air is removed therefrom; and

activating the source of acoustic energy.

34. A method according to claim 33 wherein the activation of the source causes the source
20 to produce sufficient energy to cause cavitation at the patient surface.